

Several formal amendments in claim 22 have been further effected to make the claimed subject matter clearer and to better distinguish it from prior art. All the amendments are fully supported in the original specification.

Claim 1 has been amended to conform to amended claim 22.

Claims 10, 20, and 21 have been amended to conform to claim 1, while narrowing the ambit of the originally claimed polymeric compositions to engineering thermoplastic compositions.

No new material has been added.

Election/Restriction

2. The Examiner notes that claims 10, 20, and 21 are now directed to engineered thermoplastic instead of to original polymeric composition, and concludes that, for that reason, said claims are directed to a distinct invention and should be withdrawn. The applicant believes that engineered thermoplastic is a special kind of a polymeric composition, and it would narrow the claim ambit.

Nonetheless, the claims have now been amended to replace "engineered thermoplastic(s)" in the previously presented claims with "engineered thermoplastic compositions". The latter term is supported in the specification throughout, for example on pages 1-3, 5, 6, 13, and 21. Original claim 1 comprised a term "polymeric compositions", but it is obvious that the term "engineering plastics compositions" is included within the term "polymeric compositions". The amendment in fact narrows the ambit, as not all polymers must be plastic, and as not all plastics are engineering plastics, which is known, and which is also clear from reading pages 2,3, 5, and 13 of the specification.

It is respectfully submitted that the above described amendments address the Examiner's comments in regard to distinct inventions, which are considered to be now moot. It is believed that amended claims 10, 20, and 21 are not directed to non-elected invention and should not be withdrawn.

Claim Rejections – 35 USC §112

3. Claims 1-4, 6-10 and 20-22 are rejected under 35 U.S.C. 112 as failing to comply with the written description requirement, particularly in regard to the new limitation in claim 22 reading: *"said method being characterized in that it does not include any step wherein residual organic solvents are removed"*.

The above negative limitation, relating to the absence of steps removing residual solvents, has a clear basis in the original disclosure. A person skilled in the art is taught by the instant specification that it is desirable to get rid of residual organic solvents form the instant flame retardants (for example, lines 8-10 on page 3). It is emphasized that it is very difficult to remove residual organic solvents during the production of the instant products (paragraph bridging pages 2-3), but in spite of that, the present invention aims at providing such a product without residual solvents (lines 22-24 on page 3), which means without drying the final product. Indeed, the invention provides a product with low residual solvent without said difficult steps of drying the product. A negative limitation must have basis in the original disclosure, which basis should clearly teach a skilled person the desirability and necessity of the limitation. Even if not being literal, said basis

has to be factual and instructive. The passage from line 35 on page 2 to line 3 on page 3 reads:

...high molecular weight brominated epoxides are very viscous, even at higher temperatures, and it is very difficult to reduce volatile content to very low levels. It is therefore advantageous to use low molecular weight brominated epoxides with very low volatile content as a starting material for the production of high molecular weight brominated epoxides.....

The above passage would clearly teach a skilled person to obviate the drying step in case of high molecular weight brominated epoxides and, instead, obtain dry low molecular weight materials and react them to get dry high molecular materials.

Although the basis for negative limitation need not be literal, claim 22 has now been amended, in response to the above rejection, to read:

"said method being characterized in that it does not include any step of removing the solvent from said high molecular weight brominated epoxide".

The above important feature is not only factually supported throughout the specification, but its wording is now literally supported, for example, at the first two lines and at the last two lines of Example 3, on page 8:

*...it was attempted to remove dioxane solvent from tribromophenol end-capped high molecular weight brominated epoxide by subjecting it to high vacuum...
...even when employed lab conditions, it is difficult to remove the solvent from the high molecular weight epoxy resin...*

It is believed that, in view of the above amendments and explanations, the rejection is moot.

Claim Rejections – 35 USC §103

4. Claims 22, 1-3 and 6-9 are rejected as being unpatentable over Nakai et al. (US 5,250,590) in view of Nantaku et al. (JP 2001-310990). The Applicant respectfully traverses the Examiner's rejection.

5. The applicant wishes to emphasize a very important fact, which seems to have eluded from the present debate. The instant invention is based on three inventors' findings:

- i) the processing behavior of the instant flame retarding (FR) product, namely high molecular weight brominated epoxy (HMW BE) containing less than 100 ppm solvent, critically depends on trace amounts of residual solvents (99.99% material has much better engineering properties than 99.96% material);
- ii) said trace amounts of residual solvent in the HMW BE unexpectedly affects also the processing behavior of the retarded polymeric composition comprising said product; and

iii) the HMW BE is enormously difficult to dry while LMW BE is not.

Some of the above points may seem to be obvious or known before the date of the present application, but this is a hindsight impression, partially created by reading the instant specification which explains, in a straightforward way, some facts known before the invention together with the goals of the instant invention. However, a careful examination of prior art shows that the points are not taught in prior art: neither said three points together are taught, nor any one of them separately. The cited publications, neither separately nor combined, would not have led a person skilled in the art to the instant process and product. The above mentioned points, in fact, surprised even the inventors of the instant technology during development stages. Attached with this response is a Declaration of one of the inventors.

6. The Examiner reviews Nakai et al. and suggests that they essentially provide the instant retardant (page 4 of her letter), noting that no solvent is used and no solvent is removed in the Nakai's production, implying that the product would have to be identical to the instant product. However, if they had not tried to remove any solvents from the final product, they would necessarily have had more residual solvents than claimed by the present invention; and if they had tried to remove the solvents from their final product, they could not have managed to lower the residual solvent below the claimed level within practical time periods (please see the Declaration). As a skilled person knows, brominated epoxides inherently comprise residual solvents, which can be seen when checking the available materials in provider's catalogs (see, for example, brominated epoxy in the Internet site of the Dow Chemical Company, comprising ketonic solvents).

There was no motivation before the present invention to lower the amount of residual solvent below 500 ppm. The Examiner seems to be aware of the fact that Nakai's teaching by itself does not lead to the present invention, and she cites Nantaku. On page 5 of her letter, she states (underlined by the applicant):

...Nantaku et al. teaches using a low molecular weight epoxy having a molecular weight of 790 g/mol ... At the time of the invention a person having ordinary skill in the art would have found it obvious to use the low molecular weight epoxy of Nantaku et al. in the process of Nakai et al. and would have been motivated to do so since viscosity is dependent on molecular weight and a low viscosity reactants is easier to mix in the reaction.

However, the Examiner's statement disregards the Nakai's main goal, namely to use a high molecular weight halogen retardant (possibly HMW BE), while improving the processability and heat stability of the retarded resin by admixing a polycarbonate (lines 49-51 at column 1, lines 1-3 at column 2). The high molecular weight of the FR does not matter to Nakai et al. and they never imply that the molecular weight should be lowered; on the contrary, they explain why it must be kept within certain range (lines 21-24 at column 4), and insist on "high molecular weight" (claim 1). Moreover, Nakai et al. do not emphasize need of better mixing but need for improving heat stability, which is achieved by their admixture of polycarbonate. They have different goals, and different solutions than the instant invention. The main concern of the instant invention is residual solvent, and its main goal is to lower the solvent to unusually low, nowhere mentioned, quantities. Even if, in a thought experiment, the two publications should be combined to

produce the instant invention, it would be nearly impossible. A person of ordinary skill in the art would not go against Nakai's teaching about the destructive effect of FR low molecular weight on impact resistance of the composition (line 22 at column 4); a skilled person is taught by Nakai that the polymerization degree of the FR should never decrease below n = 4, whereas Nantaku uses n = 1. Nakai and Nantaku are incompatible.

Furthermore, Nantaku et al. relates to epoxy materials obtained from the reactions using excessive solvent (all their examples), whereas Nakai et al. are silent about the solvent. The resultant teaching of combined Nakai with Nantaku would be the reaction with excessive solvent.

Neither Nakai nor Nantaku relate to the importance of extremely low solvent amount in the final product. In view of the above analysis, it is obvious that the two cited documents would not have led a person skilled in the art to the instant invention. The instant retardant for thermoplastic compositions, exhibiting superior engineering properties, is therefore novel and non-obvious over the prior art, as well as the method for producing it.

Claim Rejections – 35 USC §102 /§103

7. Claims 1, 3, 4, and 6-9 are rejected as anticipated by or, in alternative, as obvious over Nantaku et al. (JP 2001-310990). The Applicant respectfully traverses the Examiner's rejection.

The Examiner acknowledges, at the last two lines on page 8, that the method of making the flame retardant according to instant claim 22 is different from what is disclosed in Nantaku. But, it seems that the Examiner implies that the Nantaku's product and the instant FR are the same. However, the instant product is different; the product, as defined in the amended claims, is FR for engineering thermoplastic compositions containing less than 100 ppm of organic solvents and increasing melt flow index of said compositions. The highly specific chemical composition of the claimed FR, containing less than 100 ppm solvents, is never implied in prior art, neither are unexpected results of such low content, such as superior engineering properties.

The Examiner states that Nantaku removes organic solvent. Of course, since Nantaku uses excess of the solvent, the solvent must be at least partially removed, in order not to transport the product with unnecessary solvent mass, which in addition to it is environmentally unfriendly. However, to remove bulk solvent is a totally different task than removing residual solvent down to the level of ppm. The applicant demonstrated in the application, for example in Example 3, that the brominated epoxy resins cannot be freed of residual solvents down below the level of 1000 ppm within any practical time period even under extreme drying conditions. The Examiner notes that Examples 2 and 3 are not the same as the examples disclosed in Nantaku et al. and therefore no comparison is possible (page 10 of the letter). Strangely, the Examiner states, on page 5, that Nantaku teaches a similar composition, while opining, on page 9, that the two flame retardants are the same. It is believed that the compositions are either different or the same; in the former case, the instant invention does not lack novelty, in the latter case, the compositions can be compared in regard to their behavior under drying – and the applicant's observation about impossibility to reach low solvent holds.

Conclusion

8. It is believed that the claims after the current amendments define a novel and non-obvious invention, particularly in view of the above explanations and the Declaration, and their allowance is respectfully solicited.

Respectfully submitted

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